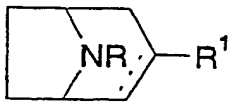
Claims:

1. A compound having the formula,



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any of its enantiomers or any mixture thereof, or a pharmaceutically acceptable salt thereof;

wherein

---- is a single or a double bond;

R is hydrogen, alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkylalkyl, aryl or aralkyl; and

R^1 is

, wherein R^2 is hydrogen, alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkylalkyl, amino; or

aryl which may be substituted one or more times with substituents selected from the group consisting of alkyl, cycloalkyl, cycloalkylalkyl alkenyl, alkynyl, alkoxy, cycloalkoxy, thioalkoxy, thiocycloalkoxy, methylenedioxy, aryloxy, halogen, CF_3, OCF_3, CN, amino, aminoacyl, nitro, aryl and a monocyclic 5 to 6 membered heteroaryl group;

a monocyclic 5 to 6 membered heteroaryl group which may be substituted one or more times with substituents selected from the group consisting of alkyl, cycloalkyl, cycloalkylalkyl alkenyl, alkynyl, alkoxy, cycloalkoxy, thioalkoxy, thiocycloalkoxy, methylenedioxy, aryloxy, halogen, CF_3, OCF_3, CN, amino, nitro, aryl and a monocyclic 5 to 6 membered heteroaryl group; or

a bicyclic heteroaryl group composed of a monocyclic 5 to 6 membered heteroaryl group fused to a benzene ring or fused to another monocyclic 5 to 6 membered

heteroaryl, all of which may be substituted one or more times with substituents selected from the group consisting of alkyl, cycloalkyl, cycloalkylalkyl alkenyl, alkynyl, alkoxy, cycloalkoxy, thioalkoxy, thiocycloalkoxy methylenedioxy, aryloxy, halogen, CF_3, OCF_3, CN, amino, nitro, aryl and a monocyclic 5 to 6 membered heteroaryl group;

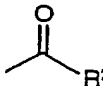
provided however, that the compound is not:

3-(1,2)-benzoisoxazol-3-yl)-8 methyl-8-azabicyclo [3.2.1] octane hydrochloride monohydrate;
3-(1,2)-benzoisoxazol-3-yl)-8-azabicyclo [3.2.1] octane hydrochloride monohydrate;
3-(6-fluoro-1,2-benzoisoxazol-3-yl)-8 methyl-8-azabicyclo [3.2.1] octane hydrochloride;
3-(6-fluoro-1,2-benzoisoxazol-3-yl)-8-azabicyclo [3.2.1] octane hydrochloride;
3-(1H-indazol-3-yl)-8-methyl-8-azabicyclo [3.2.1] octane;
3-(1H-indazol-3-yl)-8-azabicyclo [3.2.1] octane;
3-(6-fluoro-1H-indazol-3-yl)-8-methyl-8-azabicyclo [3.2.1] octane;
3-(6-fluoro-1H-indazol-3-yl)-8-azabicyclo [3.2.1] octane;
3- [1,2-benzisothizol-3-yl] -8-methyl-8-azabicyclo [3.2.1] octane hydrochloride;
3-(1,2-benzisothiazol-3-yl)-8-azabicyclo [3.2.1] octane;
8-methyl-3-(3,4-dichlorophenyl)-8-azabicyclo [3.2.1] oct-2-ene;
8-methyl-3-(4-chlorophenyl)-8-azabicyclo [3.2.1] oct-2-ene;
8-methyl-3-phenyl-8-azabicyclo [3.2.1] oct-2-ene;
8-methyl-3-(4-methylphenyl)-8-azabicyclo [3.2.1] oct-2-ene;
8-methyl-3-(4-trifluoromethylphenyl)-8-azabicyclo [3.2.1] oct-2-ene;
8-methyl-3-(4-fluorophenyl)-8-azabicyclo [3.2.1] oct-2-ene;
3-(4-chlorophenyl)-8-azabicyclo [3.2.1] oct-2-ene;
3-(3,4-dichlorophenyl)-8-azabicyclo [3.2.1] oct-2-ene;
4-chloro-2,6-diamino-5 [8-(1-naphtyl)-8-azabicyclo [3.2.1] oct-3-yl] pyrimidine;
4-chloro-2,6-diamino-5 [8-(2-naphtyl)-8-azabicyclo [3.2.1] oct-3-yl] pyrimidine;
8-methyl-3-phenyl-8-azabicyclo [3.2.1] octane;
8-methyl-3-(2-methyl-phenyl)-8-azabicyclo [3.2.1] oct-2-ene;
8-methyl-3-(2-methyl-phenyl)-8-azabicyclo [3.2.1] octane;
3-(4-fluorophenyl)-8-azabicyclo [3.2.1] oct-2-ene;
8-methyl-3-(1-methyl-indol-2-yl)-8-azabicyclo [3.2.1] octane; or
8-methyl-3-(1-methyl-indol-2-yl)-8-azabicyclo [3.2.1] oct-2-ene;

2. A compound of formula 1 in claim 1,
wherein

R is hydrogen, alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkylalkyl, aryl or aralkyl; and

R^1 is



, wherein R^2 is hydrogen, alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkylalkyl, amino; or

aryl which is substituted one or more times with substituents selected from the group consisting of cycloalkyl, cycloalkylalkyl alkenyl, alkynyl, alkoxy, cycloalkoxy, thioalkoxy, thiocycloalkoxy, methylenedioxy, aryloxy, OCF_3, CN, amino, aminoacyl, nitro, aryl and a monocyclic 5 to 6 membered heteroaryl group;

a monocyclic 5 to 6 membered heteroaryl group which may be substituted one or more times with substituents selected from the group consisting of alkyl, cycloalkyl, cycloalkylalkyl alkenyl, alkynyl, alkoxy, cycloalkoxy, thioalkoxy, thiocycloalkoxy, methylenedioxy, aryloxy, halogen, CF_3, OCF_3, CN, nitro, aryl and a monocyclic 5 to 6 membered heteroaryl group; or

a bicyclic heteroaryl group composed of a monocyclic 5 to 6 membered heteroaryl group with one heteroatom, fused to a benzene ring or fused to another monocyclic 5 to 6 membered heteroaryl, all of which may be substituted one or more times with substituents selected from the group consisting of alkyl, cycloalkyl, cycloalkylalkyl alkenyl, alkynyl, alkoxy, cycloalkoxy, thioalkoxy, thiocycloalkoxy, methylenedioxy, aryloxy, halogen, CF_3, OCF_3, CN, amino, nitro, aryl and a monocyclic 5 to 6 membered heteroaryl group;

3. A compound of formula 1 in claim 1 wherein
R is hydrogen, methyl, ethyl or benzyl;
R^1 is acetyl, 2-methoxyphenyl, 2-naphtyl, 3-acetamidophenyl, 2-selenophenyl 3-pyridyl, 3-(6-methoxy)pyridyl, 3-(6-chloro)pyridyl, 2-thiazolyl, 3-thienyl, 2-thienyl, 2-(3-methoxymethyl)thienyl, 2-furyl, 3-furyl, 2-(3-bromo)thienyl), 3-chloro-thien-2-yl, 3-(3-furyl)-2-thienyl, 3-quinolinyl, 3-benzofuryl, 2-benzofuryl, 3-benzothienyl, 2-benzothienyl, 2-benzothiazolyl, 2-thieno[3.2-b]thienyl, thieno[2.3-b]thienyl, 2-(3-bromo)benzofuryl or 2-(3-bromo)benzothienyl;

4. A compound of claim 1 which is

(±)-8-Benzyl-3-(3-pyridyl)-8-azabicyclo[3.2.1]oct-2-ene;

(±)-8-Methyl-3-(3-pyridyl)-8-azabicyclo[3.2.1]oct-2-ene;

(±)-8-Methyl-3-(3-quinolinyl)-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(3-Benzofuryl)-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(3-Benzothienyl)-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(2-Thiazolyl)-8-Methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-8-Methyl-3-(2-methoxyphenyl)-8-azabicyclo[3.2.1]oct-2-ene;

(±)-8-Methyl-3-(3-thienyl)-8-azabicyclo[3.2.1]oct-2-ene;

(±)-8-Methyl-3-(2-naphtyl)-8-azabicyclo[3.2.1]oct-2-ene;

Exo-8-Methyl-3-(3-pyridyl)-8-azabicyclo[3.2.1]octane;

(±)-8-H-3-(3-Pyridyl)-8-azabicyclo[3.2.1]oct-2-ene;

(±)-8-Methyl-3-[3-(6-methoxy)-pyridyl]-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-Acetyl-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-8-Methyl-3-[3-(6-chloro)-pyridyl]-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(2-Benzofuryl)-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(2-Benzothienyl)-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(3-Acetamidophenyl)-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(3-Aminophenyl) 8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(2-Thienyl)-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-[2-(3-Methoxymethylthienyl)]-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(2-Benzothiazolyl)-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(2-Furyl)-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(2-Thieno[3.2-b]thienyl)-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(2-Thieno[2.3-b]thienyl)-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(2-Selenophenyl)-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(2-Benzofuryl)-8-H-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-[3-(3-Furyl)-2-thienyl]-8-H-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-(2-Benzofuryl)-8-ethyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-[2-(3-Bromothienyl)]-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-[2-(3-Bromobenzofuryl)]-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

(±)-3-[2-(3-Bromobenzothienyl)]-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

3-[2-(3-Chlorothienyl)]-8-methyl-8-azabicyclo[3.2.1]oct-2-ene; or

(±)-3-[3-(3-Furyl)-2-thienyl]-8-methyl-8-azabicyclo[3.2.1]oct-2-ene;

or a pharmaceutically acceptable addition salt thereof;

5. A pharmaceutical composition, comprising a therapeutically effective amount of a compound of any of the claims 1 to 4, or a pharmaceutically acceptable addition salt thereof, together with at least one pharmaceutically acceptable carrier or diluent.

6. The use of a compound according to any of the claims 1 to 4 for the manufacture of a medicament for the treatment of a disease of a living animal body, including a human, which disease is responsive to the activity of nicotinic ACh receptor modulators.

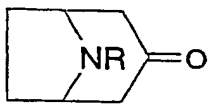
7. The use according to claim 6 wherein the disease to be treated is pain, a disease in the central nervous system, a disease caused by smooth muscle contraction, neurodegeneration, inflammation, chemical substance abuse or withdrawal symptoms caused by the cessation of intake of the chemical substance.

8. The use of a compound according to claim 7 wherein a disease in the central nervous system is Alzheimer's disease, Parkinson's disease, memory dysfunction or attention deficit hyperactivity disorder.

9. The use according to claim 7 wherein the disease is chemical substance abuse or withdrawal symptoms caused by the cessation of intake of the chemical substance, said chemical substance abuse being smoking or use of other nicotine containing products and withdrawal symptoms caused by cessation of use of nicotine containing products;

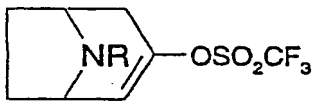
10. A method for the preparation of the compounds according to claim 1 comprising the step of reacting a compound having the formula

a) the step of reacting a compound having the formula



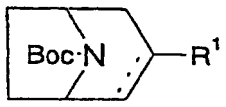
wherein R is as defined above, with a compound of the formula R^1-Li, wherein R^1 is as defined above followed by dehydration of the compound obtained;

b) the step of reacting a compound having the formula



wherein R is as defined above, with a compound of formula R^1-X, wherein R^1 is as defined above and X is halogen, boronic acid, or trialkylstannyl; or

c) the step of reducing a compound having the formula



wherein R^1 is as defined above or ;

11. A method of treating a disease of a living animal body, including a human, which disease is responsive to the activity of nicotinic ACh receptor modulators, comprising the step of administering to such a living animal body, including a human, in need thereof a therapeutically effective amount of a compound according to any of the claims 1 to 4.

12. The method according to claim 11, wherein pain, a disease in the central nervous system, a disease caused by smooth muscle contraction, neurodegeneration, inflammation, chemical substance abuse or withdrawal symptoms caused by the cessation of intake of the chemical substance are treated;

13. The method according to claim 12 wherein chemical substance abuse or withdrawal symptoms caused by the cessation of intake of the chemical substance, said chemical substance abuse being smoking or use of other nicotine containing products and withdrawal symptoms caused by cessation of use of nicotine containing products, is treated;

14. The method of claim 12 wherein a disease in the central nervous system, said disease being Alzheimer's disease, Parkinson's disease, memory dysfunction or attention deficit hyperactivity disorder, is treated.